

NON-PUBLIC?: N  
ACCESSION #: 9601160231  
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Donald C. Cook Nuclear Plant - Unit 1 PAGE: 1 OF 3

DOCKET NUMBER: 05000315

TITLE: Manual Reactor Trip Conservatively Initiated Due to  
Increasing Main Turbine Vibration  
EVENT DATE: 12/07/95 LER #: 95-012-00 REPORT DATE: 01/08/96

OTHER FACILITIES INVOLVED: None DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 32

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR  
SECTION:  
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:  
NAME: Paul Schoepf, Plant Engineering TELEPHONE: (616) 465-5901,x2408  
Superintendent

COMPONENT FAILURE DESCRIPTION:  
CAUSE: SYSTEM: COMPONENT: MANUFACTURER:  
REPORTABLE NPRDS:

SUPPLEMENTAL REPORT EXPECTED: NO

#### ABSTRACT:

On December 7, 1995 at 2235 hours with Unit 1 in Mode 1 at approximately 32 percent Rated Thermal Power, while reducing power from 71 percent to 7 percent to remove the Turbine-Generator from service for repairs to the Main Transformer and Electro-Hydraulic Control System, the Unit 1 reactor was manually tripped due to increasing vibrations on the Main Turbine. The reactor trip was ordered as a conservative measure by the Unit Supervisor to prevent possible damage to the turbine.

This event is reportable under 10CFR50.73(a)(2)(iv), as an event that resulted in manual actuation of the reactor protection system. The appropriate prompt notification was made under 10CFR50.72.

The increased sensitivity of the Main Turbine to steam temperature changes after installation of the new Monoblock rotor was not fully

understood. The increased sensitivity of the machine resulted in the elevated vibration levels. To prevent a recurrence, the appropriate procedures have been revised to minimize thermal transients.

All safety systems operated normally in response to the trip signal. The event had no actual or potential adverse impact on the health and safety of the public.

END OF ABSTRACT

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Conditions Prior to Occurrence:

Unit 1 in Mode 1, Power Operation, at approximately 32 percent Rated Thermal Power.

Description of Event:

On December 7, 1995 at 2235 hours with Unit 1 in Mode 1 at approximately 32 percent rated thermal power, the Unit 1 reactor was manually tripped due to increasing vibration on the Main Turbine. Power was being reduced from 71 percent to 7 percent to remove the Turbine-Generator from service for repairs to the Main Transformer and Electro-Hydraulic Control System. At approximately 49 percent power and coincident with the removal, by procedure, of the Moisture Separator Reheater (MSR) steam supplies, the Main Turbine Bearing No. 5 vibrations started to increase. Attempts to reduce vibrations by changing oil temperatures, MSR steam pressure, and turbine load were unsuccessful. When the No. 5 Bearing right side vibration reached 13 mils, and the left side vibration at 7 mils and increasing, a reactor trip was ordered by the Unit Supervisor to prevent possible equipment damage.

The MSRs are used to remove water from the high pressure turbine exhaust steam and to reheat the dried steam prior to use in the low pressure turbine. Reheating of the turbine exhaust steam is accomplished using main steam, supplied from the Turbine Bypass Header to coils in the MSRs. Condensed steam from the MSR steam coils is collected and drained to Reheater Coil Drain Tanks (RCDTs). A level is typically maintained in the RCDTs using level control valves in the RCDT drains. During power reductions when the plant is to be operated at less than 15% power for an extended period of time, the MSRs are removed from service by isolating the steam supply from the Turbine Bypass Header. High pressure turbine exhaust steam continues to pass through the MSRs during these periods.

On December 7, 1995, while removing the MSRs from service, the Main

Turbine No. 5 Bearing vibrations began increasing. During this evolution, RCDT high and low alarms were received, and the unit supervisor directed opening of the RCDT level control valves to reduce the level in these tanks. High vibration alarms were then received for the No. 5 Bearing. Attempts were made to reduce the high vibrations by changing lube oil temperature and reducing the Main Turbine loading. In addition, direction was given to reestablish levels in the RCDTs to determine if these actions would improve the situation. When the No. 5 Bearing vibrations reached 13 mils, the unit was tripped prior to any level being restored in the RCDTs.

#### Cause of Event:

The increased sensitivity of the Main Turbine to steam temperature changes after installation of the new Monoblock rotor was not fully understood. The Low Pressure Turbine 'B' rotor was replaced with a Monoblock rotor during the Unit 1 1995 refueling outage. The new type of rotor is much more sensitive to rapid steam temperature changes than the previous rotor because of tighter clearances within the turbine assembly.

During the power reduction on December 7, 1995, the RCDT level control valves were opened in accordance with procedure to reduce RCDT level, causing a drop in Reheater coil pressure. It was determined that a 30 degrees F reheat steam temperature decrease occurred within 1 to 2 minutes following the large decrease in coil pressure. The high vibrations were caused by the rapid reheat steam temperature decrease.

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#### Analysis of Events:

This event is reportable under 10CFR50.73(a)(2)(iv) as an event that resulted in manual actuation of the reactor protection system.

The manual reactor trip was initiated due to high vibrations detected on the No. 5 Bearing located on the Unit 1 Main Turbine. Protection for the main turbine from excessive vibration is provided by the bearing vibration detection system. An automatic turbine trip occurs if vibrations exceed 12 mils on both the right side and left side vibration monitors for a particular Main Turbine bearing. Different vibration indications between the right and left sides of the bearing are expected. The higher vibration generated by the right side is a normal phenomenon due to the inherent characteristics of the rotation of the main turbine shaft in association with the bearing.

At the time the reactor was tripped, the right side vibration indication for the No.5 Bearing indicated 13 mils and the left side vibration indication was noted at 7 mils and increasing. It was presumed that the left side vibrations would shortly increase to 12 mils. Therefore, a manual reactor trip was ordered by the Unit Supervisor to prevent possible equipment damage. As a result, the turbine had not yet reached its trip setpoint, and the manual reactor trip was conservative in the direction of protecting the turbine.

All shutdown systems and components operated properly, and no equipment damage was caused by the high vibrations or the manual trip. Since all systems and components operated properly during the trip, and the trip was conservatively initiated, there was no adverse safety consequences in the event. This event had no actual or potential adverse impact on the health and safety of the public.

Corrective Action:

The procedure used for removing the MSRs from service was revised to direct the Operators to take positive actions to eliminate the RCDT fluctuations which occurred during this event. The procedure was also changed to minimize RCDT fluctuations which may occur while placing the MSRs in service. These changes now require operator action to take manual control within these tanks. By making manual level control the norm instead of a contingency, pressure changes in the MSR coils can be more positively controlled.

The revised procedure has since been successfully used to both place the MSRs in service and remove them from service.

Failed Component Identification:

None

Previous Similar Events:

None identified

ATTACHMENT TO 9601160231 PAGE 1 OF 1

Indiana Michigan  
Power Company  
Cook Nuclear Plant  
One Cook Place  
Bridgman, MI 49106  
616 465 5901

AEP

INDIANA  
MICHIGAN  
POWER

January 8, 1996

United States Nuclear Regulatory Commission  
Document Control Desk  
Rockville, Maryland 20852

Operating Licenses DPR-58  
Docket No. 50-315

Document Control Manager:

In accordance with the criteria established by 10 CFR 50.73 entitled  
Licensee Event Report System, the following report is being submitted:

95-012-00

Sincerely,

A. A. Blind  
Plant Manager

/clc

Attachment

c: H. J. Miller, Region III  
E. E. Fitzpatrick  
P. A. Barrett  
R. F. Kroeger  
M. A. Bailey - Ft. Wayne  
S. J. Brewer  
J. R. Padgett  
G. Charnoff, Esq.  
D. Hahn  
Records Center, INPO  
NRC Resident Inspector

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